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entirely different things (1) a loss in total amount or volume of produce, (2) a gain in the ratio in which that amount is divided. You cannot set off, *e. g.*, a gain of " $\frac{1}{5}$ th" against a loss of "4 tons" until you have reduced the terms to a common denominator by answering the question " $\frac{1}{5}$ th of what"? The answer is, in the case of international trade,  $\frac{1}{5}$ th of the total product or, more precisely, of the extra product resulting from the international division of labor. If the total is *constant* or nearly constant (which is the case of a revenue duty or of a duty but slightly protective), the  $\frac{1}{5}$ th is a real gain. If the total *diminishes greatly* (the case of high protection when really effective), the nominal gain of  $\frac{1}{5}$ th is in reality a loss. Two-fifths of ten oranges is four oranges, three-fifths of five oranges is three oranges; a nominal gain of one-fifth, a real loss of one orange.

The application of the foregoing reasoning to the case of the United States is obvious. If the principal condition under which protective duties can favorably influence the terms of international exchange is that they should be very moderate in amount, there would appear to be no possibility of any gain having resulted to the States from this source — provided of course that the protection has been effective. If for any reason it failed to protect, other considerations would arise.

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## WAGES AND ABILITY

THE subject of wages and ability has been a fertile one for speculation since the economists of the marginal productivity school have advanced the proposition that wage-earners tend to get what they produce. This theory has as a natural corollary that the more efficient will get more than the less efficient: the man of greater ability will receive a greater reward than the man with less ability. But few

attempts have been made to verify the proposition by any but theoretical methods.

As a radical departure from a theoretical to a statistical demonstration, Professor H. L. Moore, in his volume dealing with the laws of wages from a statistical standpoint,<sup>1</sup> devotes a chapter to the problem: "Are wages paid according to ability?" The question is important from the point of view of the application of statistical methods to economic doctrines, and also with reference to its bearing on the contentions of the socialists that labor is exploited. It is therefore of the greatest moment to make certain that any attempted proof of an affirmative answer is thoro and cogent.

Professor Moore's proof is as follows. He accepts the generalization of Galton and Pearson that ability is distributed in the general population according to the normal or probability curve. Then, applying the limitation of the wage-theory that different non-competing groups are to be considered, and assuming for the sake of simplicity that there are but two, — the skilled and the unskilled, — he divides the wage-earners equally between the two groups, the first fifty per cent unskilled and the second fifty per cent skilled. It will readily be seen that the wages might be paid according to ability within each group without fixing in any way the respective shares of the total wage dividend that each group would receive. But he finds that the first fifty per cent of the wage-earners in France get 39.819% of the total wage dividend; and Professor Moore sets himself the following problem: if wages are paid according to ability in each group with the lower group receiving 39% of the total wages, what kind of a curve of distribution of wages will result, and will this ability-wage curve be at all comparable to the actual curve of distribution according to the French statistics?

Professor Moore first simplifies the problem from the mathematical standpoint by taking a "standard population" of 100, so chosen that the distribution of wages in this stand-

<sup>1</sup> *Laws of Wages, an Essay in Statistical Economics.* New York, 1911.

ard population will correspond in every way with the distribution in a larger population; the advantage being that he can impose on this standard population any conditions he chooses and have a common basis of numbers on which to compare the resulting curves. Then he divides this "standard population" into two equal parts, one, unskilled, earning 39% of the total wage with a minimum wage of 2.36 francs, and the other, skilled, earning 61% of the total, with a maximum wage of 10.18 francs.

According to the differential theory of wages, wages in each group will consist of two parts: first, the minimum wage of the group, and second, a differential based on the difference of ability of each man over the lowest man in the group. In the given standard population, each man in the lower group earns the 2.36 francs minimum plus an amount which corresponds to his part of the remainder of the 39% due to his position on the scale of ability. Each man in the upper group will likewise receive the minimum wage in the group plus a differential corresponding to his advantage in ability over the lowest man in his group; but the minimum wage in this group just exceeds the maximum wage in the first group; that is, is equal to the wage of the fifty-first man. How is the amount of the differential determined? Here Galton's generalization comes in. It is determined by the difference of ability of each man over the least able in the group, which is easily found by mathematical processes from the equation of the probability curve according to which ability is distributed.

By these processes Professor Moore finds the distribution of wages on the basis of ability; that is, he finds what the curve of the distribution of wages would be if wages were paid according to ability. This curve he compares with the actual distribution of wages in France, and finds that the two curves agree closely, and he therefore concludes that wages in this case *are* distributed on the basis of ability. "The fact that the smooth curve of the actual data is practically congruent with the smooth curve of the standard population shows that in this case a doctrine of pure economics is statistically verified."

Is this conclusion valid? Does the fact that the two curves are "congruent" show "that the doctrine of pure economics is statistically verified"? To put a simpler case. Suppose that there were but one group, and it was found that the mathematical computation of the wages that would be paid on the basis of ability and the actual distribution of wages gave curves that coincided, — would the fact of the congruence of the curves prove the point at issue? The computation according to the theory that ability is distributed according to the probability curve will in this case give simply a probability curve. And it is a proved fact, which Professor Moore himself cites, that height, weight, strength, lung capacity, any characteristic almost of the human species, — all are distributed according to the probability curve. These curves are as congruent with the curve of actual wages as is the curve of ability! With the same reasoning as that which Professor Moore uses, wages are paid according to height, weight, strength, and what-you-will, if the congruence of the curves has any significance. The mere fact of congruence proves nothing. The only way to prove that there is a correlation between ability and high wages, is to show that low ability corresponds with low wages, and high ability, with high wages. The fact that ability, strength, and wages have coincident curves of distribution proves nothing as to their connection.

Professor Moore's analysis of the problem is not quite so simple. Does the fact that he has divided his population into two groups and then computed his curve make any real difference with the validity of his reasoning as to the correlation proved by the congruence of the curves? Clearly not. It does make a difference with the character of the theoretical curve, for he has incorporated into it the actual distribution of wages as far as the total received by each half is concerned; and his argument seems to receive an appearance of validity from the fact that it is obvious that the unskilled or lower half are really less able than the upper half, and from the fact that the lower half do not get on the average as much as the skilled men. But the fact

that the unskilled receive less than the skilled is in the original statistics of the French Report, and can be deduced without any recourse to higher mathematics. Professor Moore's curves prove nothing. Since the fact that the unskilled receive less than the skilled is incorporated into the theoretical curve, it does illustrate that fact; but the congruence of the theoretical and the actual curves of wages proves nothing. No data are given that can be applied to the fundamental proposition whether the lower wages in the lower group are correlated or are not correlated with a lower grade of ability.

Professor Moore finds the minimum in each group, and adds to it a differential proportioned to the difference in ability of each man over the man receiving the lowest wage; that is, "a wage on the basis of ability." What he really obtains is a little different. When he determines the differential which each man in the group will receive — "the differential according to ability" — what he really finds is the differential according to the probability curve according to which ability is distributed. But this is actually the differential which each man would receive over the minimum if it were a simple case of chance, — a wage on the basis of any "chance" distribution. It is true that there is no other way that the differential due to ability can be measured; yet this differential is a measure not merely of difference of ability. The same curve would be used to determine a differential if the hypothesis of distribution of wages on the basis of strength, height, or chance itself (all of which are distributed according to the same normal curve) were the hypothesis to be tested.

Professor Moore's syllogism is really as follows: the actual curve of wage distribution is found to agree with a theoretical curve of wage distribution, when this distribution is made according to the probability curve, *i. e.*, chance. But ability is distributed according to the probability curve. Therefore, so runs Professor Moore's conclusion, wages are distributed according to ability. There is evidently a logical slip in the proof.

While the chapter on wages and ability is thus open to serious criticism, it would, perhaps, be unfair to criticize it without speaking of the high merit of the remainder of the work. Professor Moore has drawn interesting and valid conclusions in the other chapters of the book, — correlations which support theoretical deductions hitherto without statistical foundation. Professor Moore has really made a new departure in economic science. He has introduced a movement that will ultimately demand a verification of theory by actual data, which in turn will be a first step toward the concrete application of economic laws to practical ends, based as they will be not on theory alone, but on fact.

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### THE PENNSYLVANIA STATE RAILROAD COMMISSION

In the several states of the United States "between 1902 and 1908 over 800 distinct provisions were enacted to regulate purely state traffic, eight new commissions were created, and seven of the thirty-one already in existence were re-organized";<sup>1</sup> leaving only seven states in the union without a public service commission of some kind. One of the eight newly formed commissions was in Pennsylvania, where Governor Stuart signed the creating act on May 31, 1907. Pennsylvanians had felt for some time that the railroads were abusing their powers, and the legislature had attempted a few years before to lessen railroad charges by imposing a flat two-cent passenger rate. When this law was declared unconstitutional, different means of check were found to be necessary. The legislature went into session pledged to create a commission, and the act of 1907 was the result.

<sup>1</sup> G. G. Huebner, in *Annals American Academy*, July, 1908, p. 138.